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Large Optics Diamond Turning Machine (LODTM)

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ASPE

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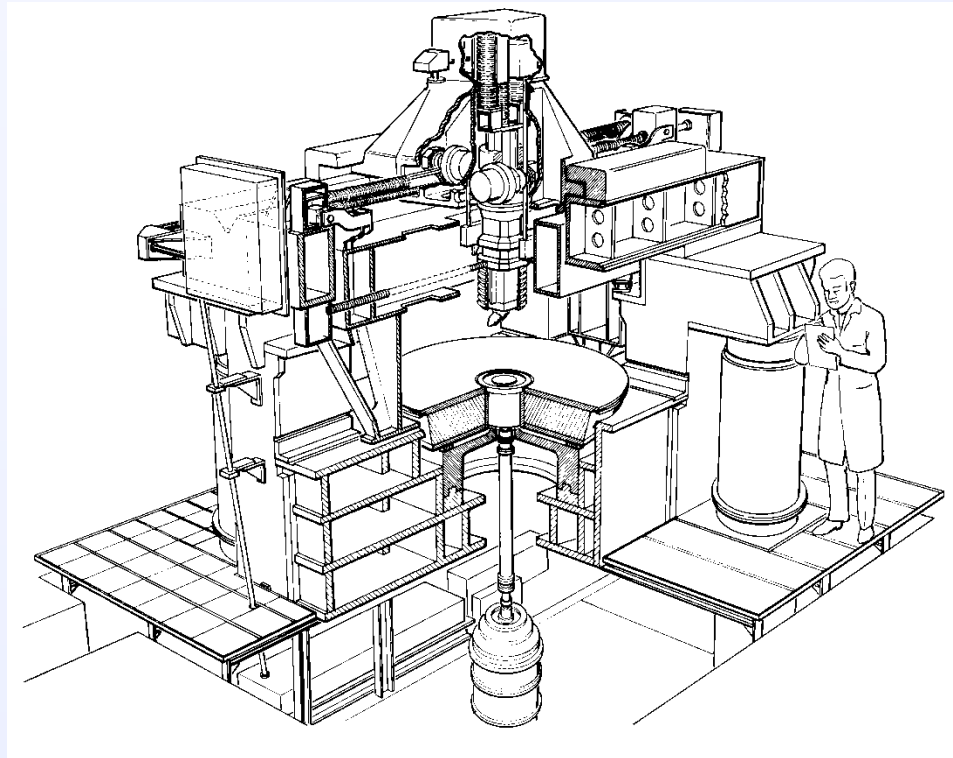
Large Optics Diamond Turning Machine (LODTM)

9-21-09



Keith Carlisle

Large Optics Diamond Turning Machine (LODTM)

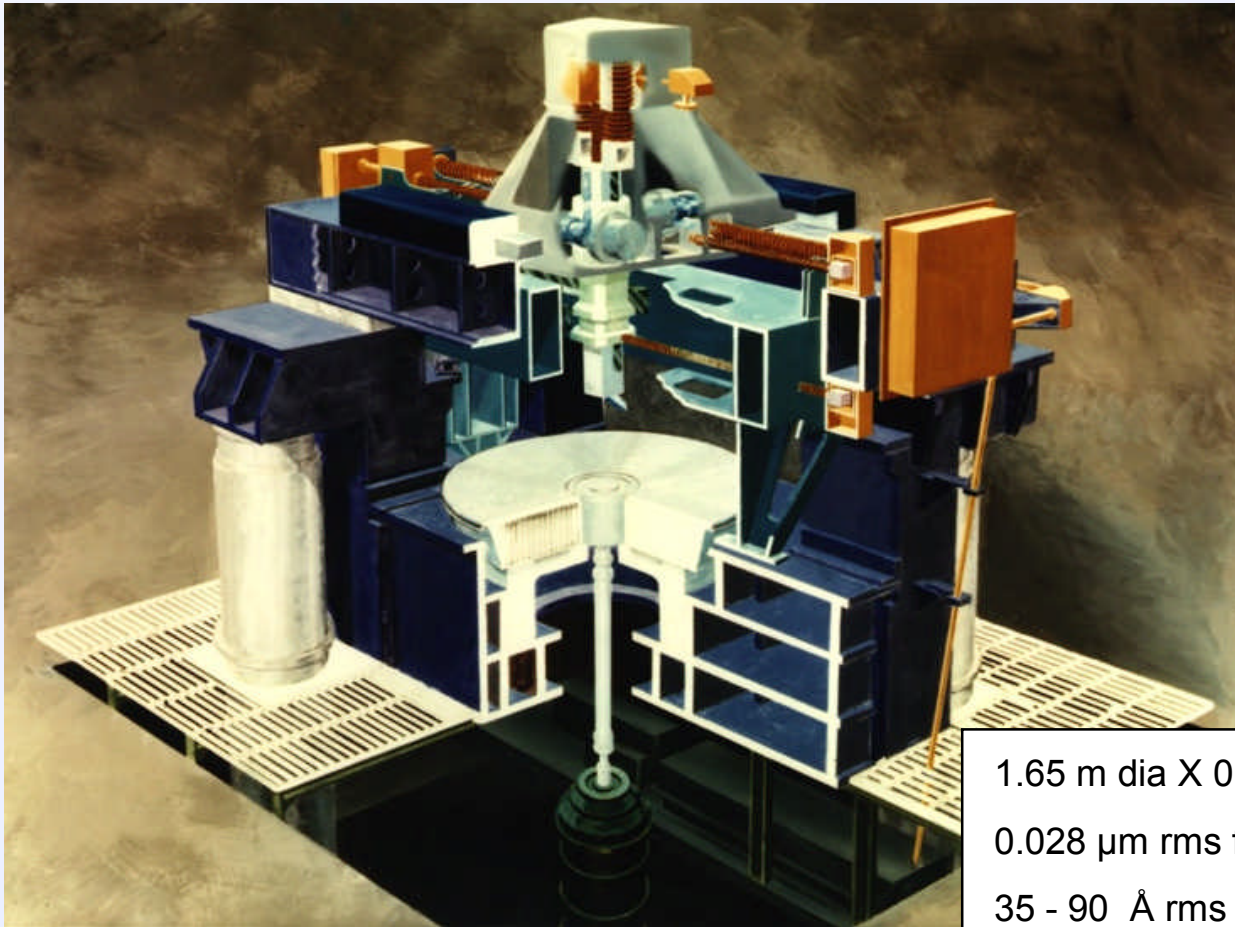


Technologies utilized by LODTM to achieve ALPHA quality SPDT

- super invar metrology frame
- precision temperature stabilization of metrology frame (water jacket around metrology frame with 100 gallons/min at $\pm 1/2$ m°F over 24 hours)
- precision temperature air shower over LODTM (18,000 CFM at ± 5 m°F over 24 hours)
- capstan direct drive using dc servo actuators
- spindle motion compensation in real-time (1.5 ms update)
- straightness and squareness error correction in real-time (1.5 ms update)
- multiple sensors (7 laser interferometers, 4 differential cap. gauges, 1 encoder) used to compute tool-to-part X/Z coordinates in real-time (1.5 ms update)
- evacuated interferometer beam paths

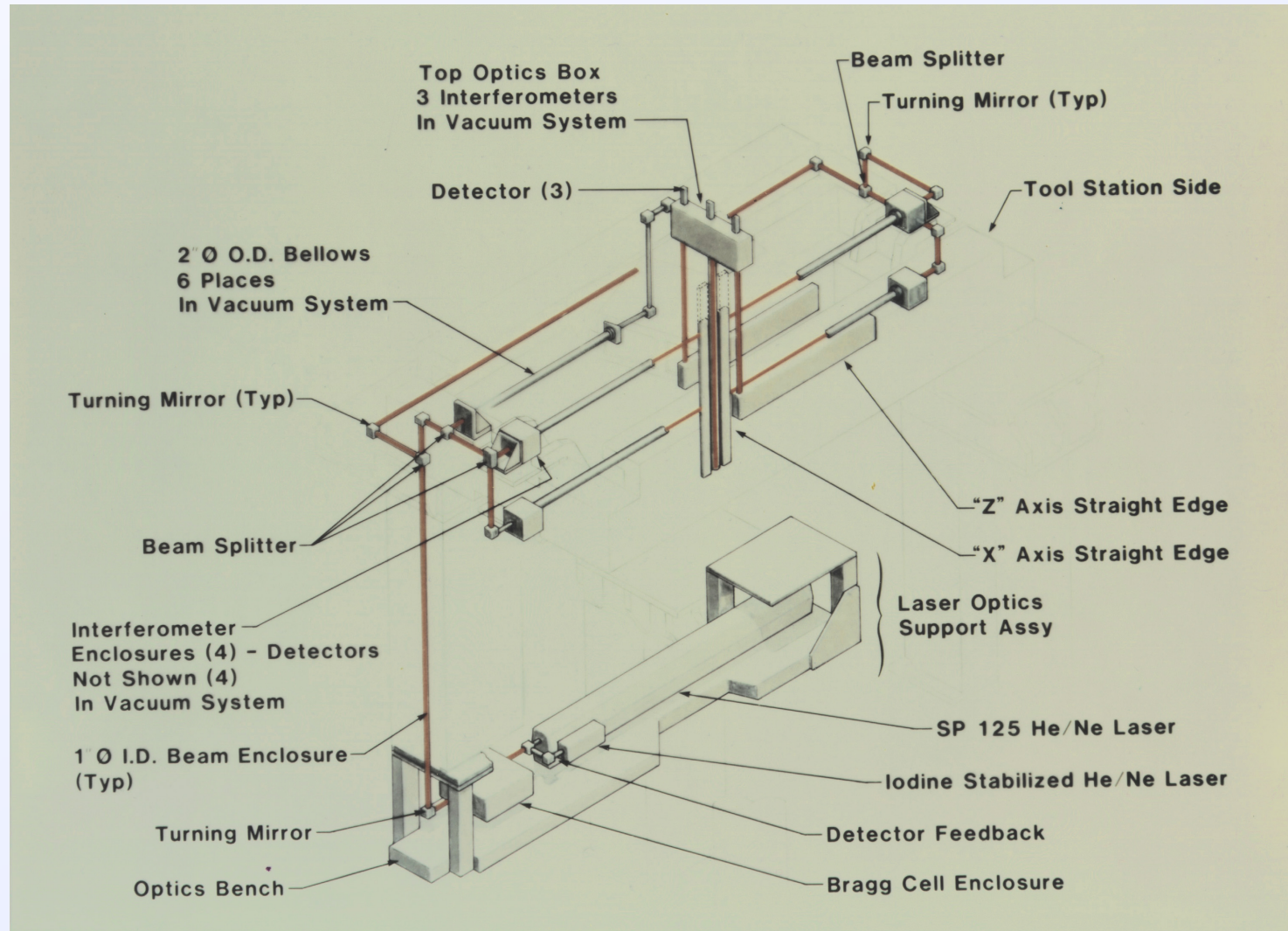


LODTM provided the highest accuracy in precision turning and dimensional metrology for its meter size capacity

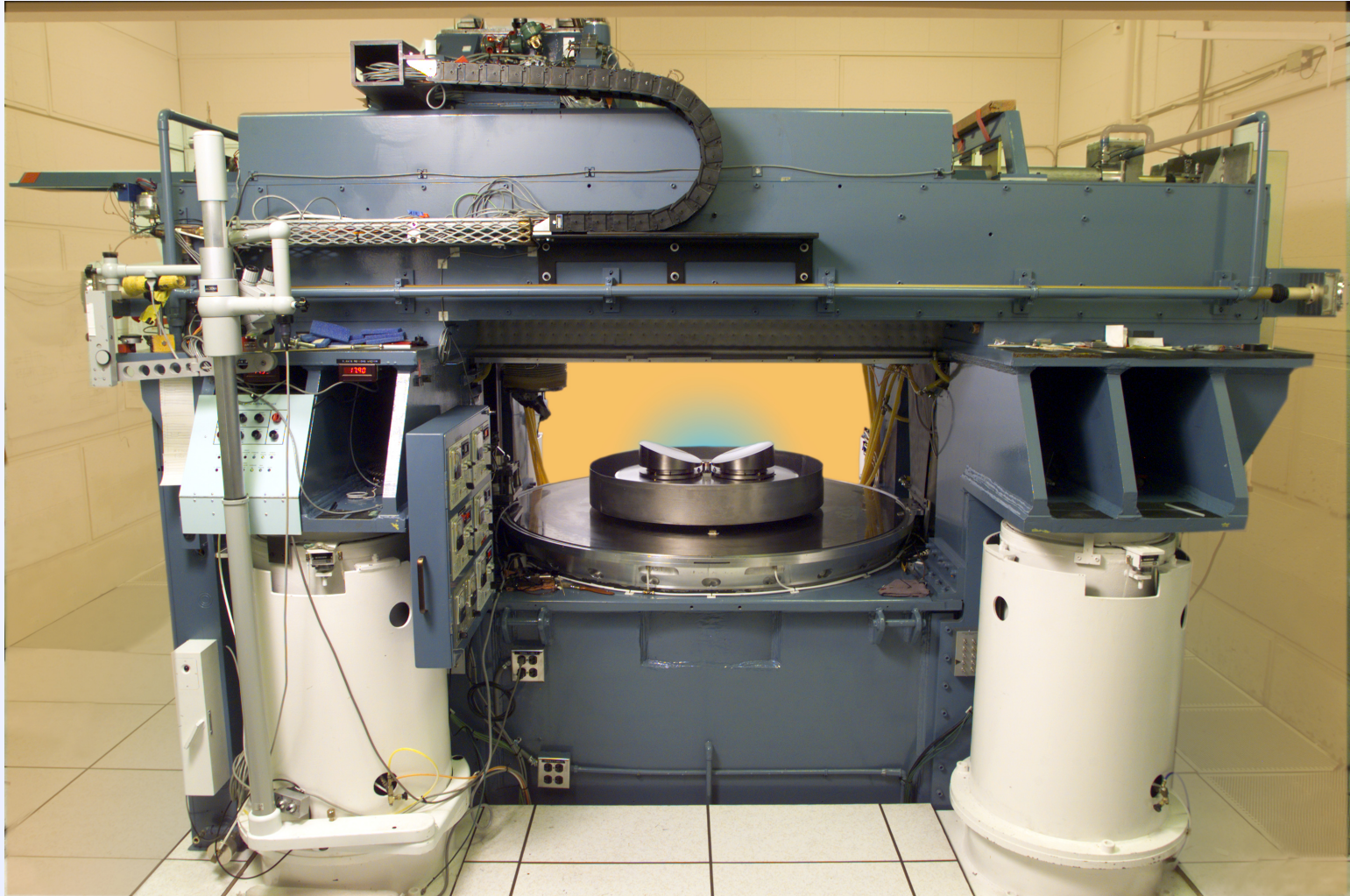


1.65 m dia X 0.5 m work zone
0.028 μm rms figure accuracy
35 - 90 \AA rms surface finish

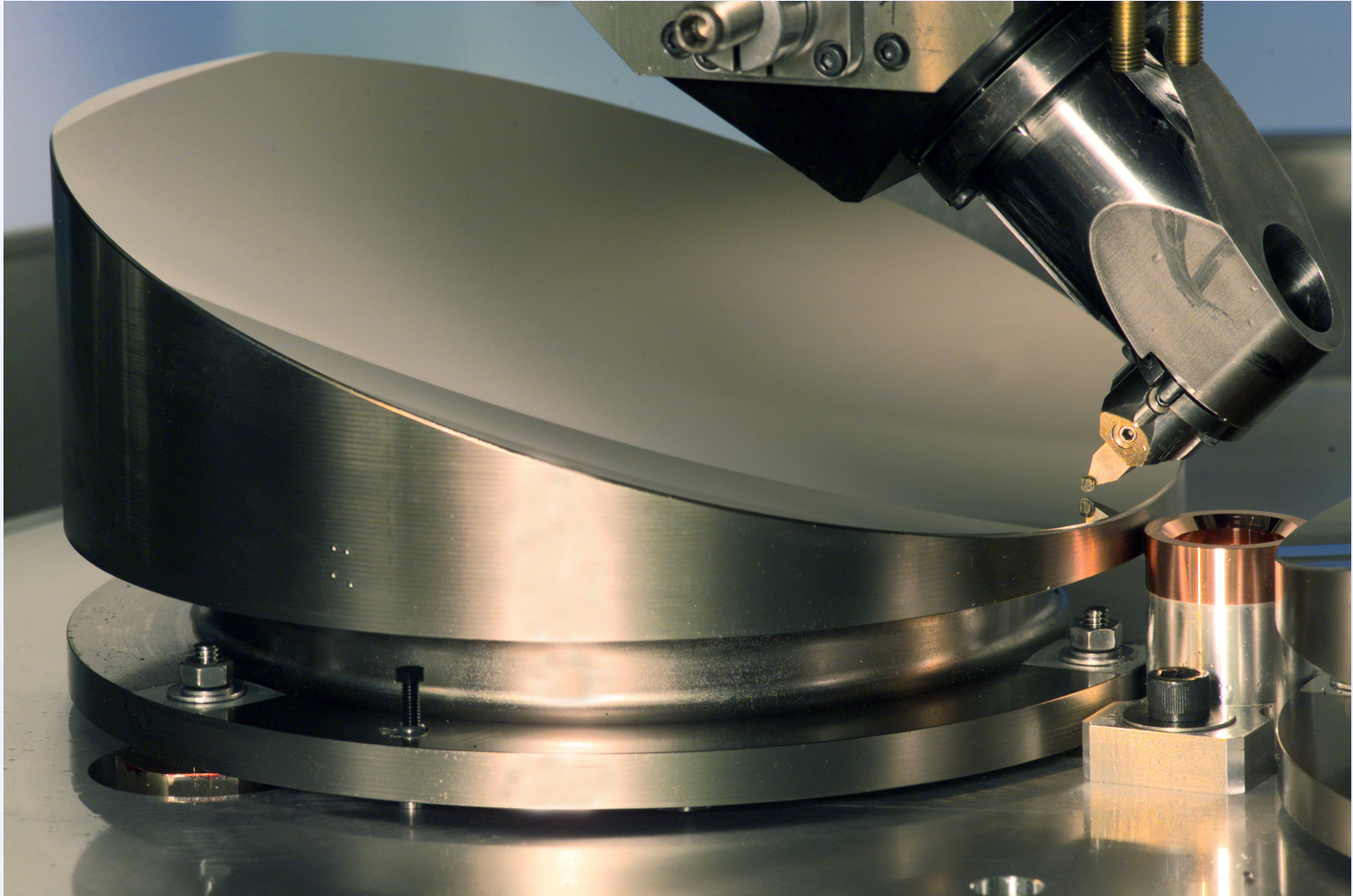
LODTM "X" & "Z" Laser Metrology Frame



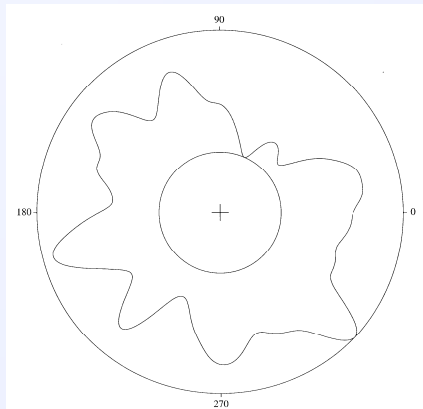
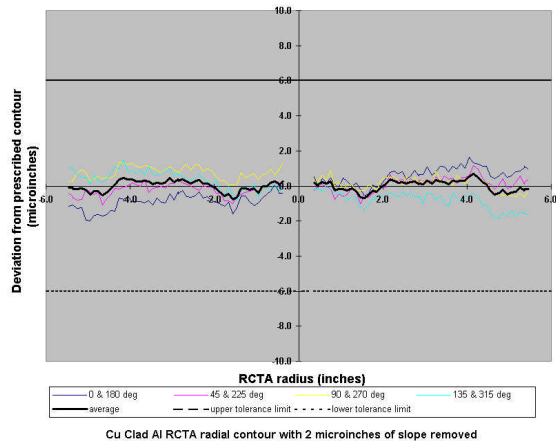
LODTM Preparation for Off Axis Mirrors



LODTM Diamond Machining an Off Axis Mirror



LODTM Diamond Turned & Inspected a Cu-clad RCTA to ALPHA Quality

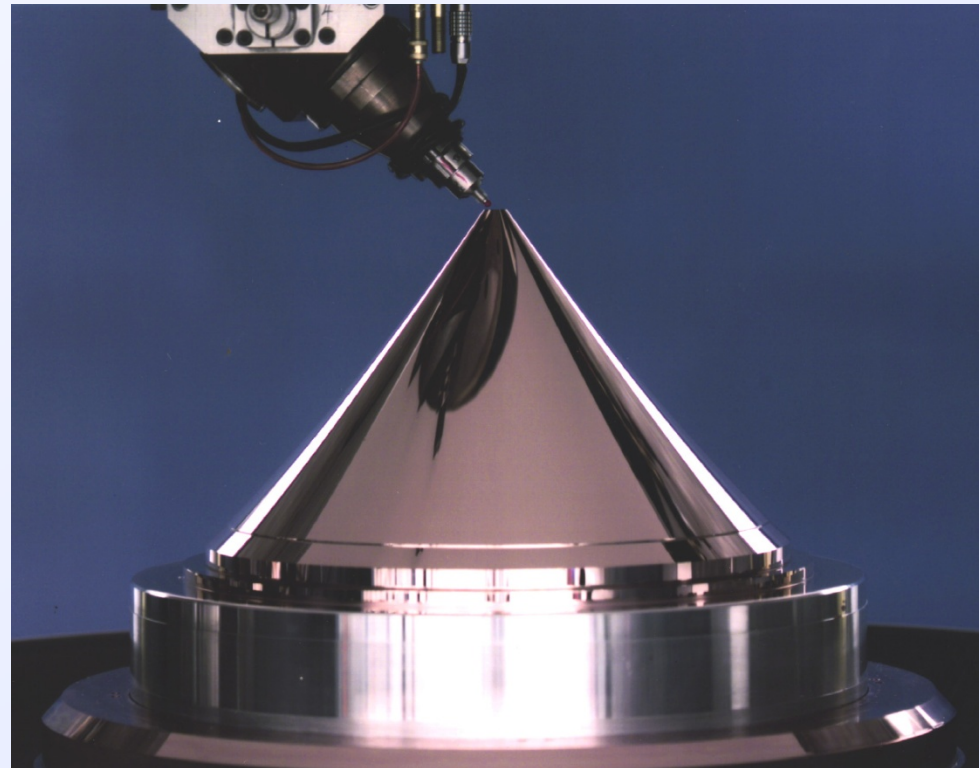


Span from inner to outer circle = 1.1 μ inches

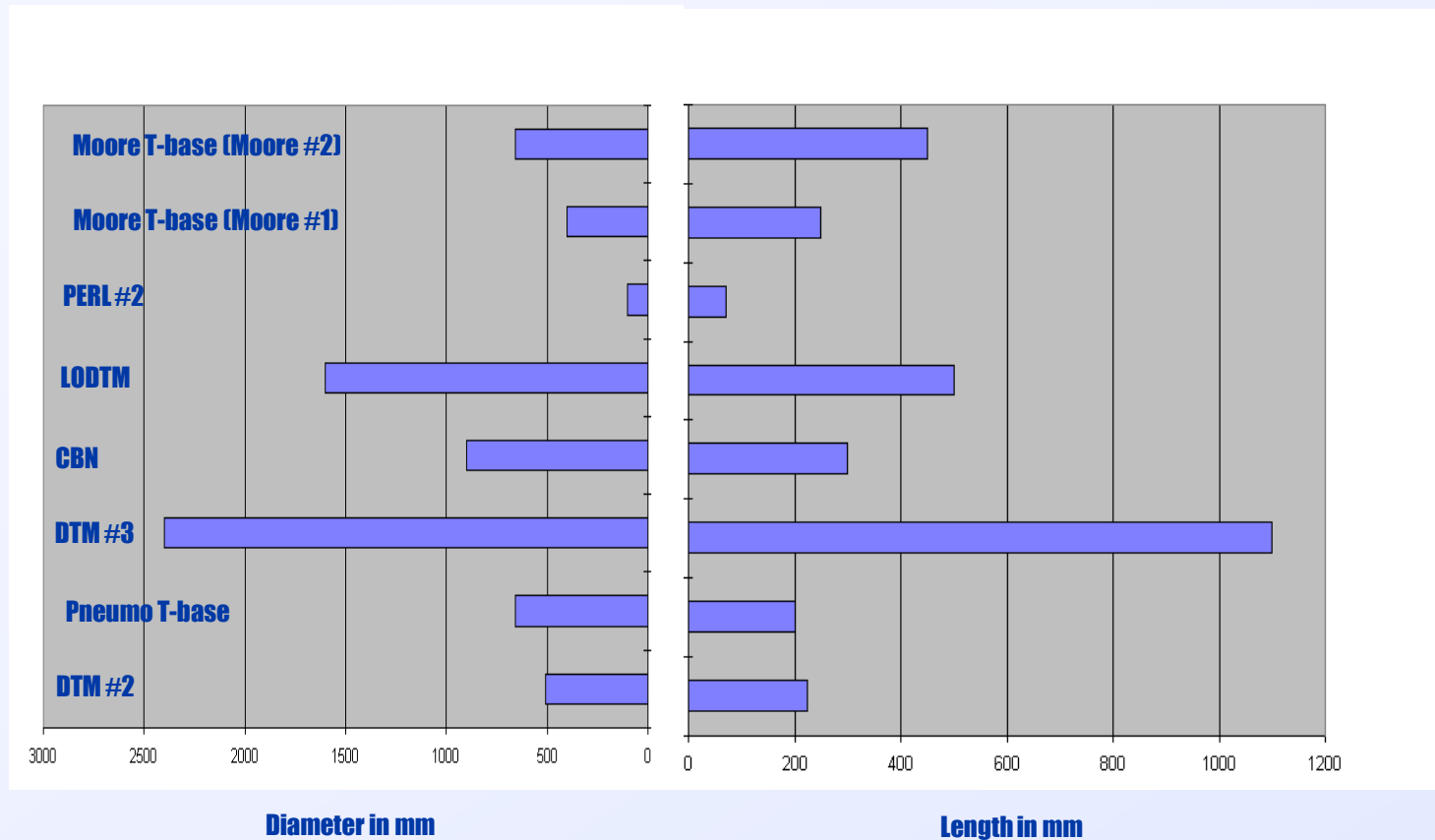
Date: 17-September-1998

Centering: Not centered

Filtering: 41.7 UPR



Working volumes for selected LLNL diamond turning machines



Typical contour and surface finish on copper parts for selected LLNL diamond turning machines

